# SECTION VII.—WEATHER AND DATA FOR THE MONTH.

## THE WEATHER OF THE MONTH.

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### PRESSURE.

The distribution of the mean atmospheric pressure over the United States and Canada and the prevailing direction of the winds are graphically shown on Chart VII, while the average values for the month at the several stations, with the departures from the normal, are shown in Tables I and III.

The mean pressure for the month as a whole was below the normal over most of the country. The only sections showing positive departures were the coastal portion of the Gulf States, the southern Rocky Mountain and Plateau regions, California, and central Washington. The positive departures as a rule were small, the greatest values appearing in central California. However, the negative departures were quite marked in the upper Lake region, the upper Mississippi and lower Missouri valleys, and the extreme eastern and the Rocky Mountain portions of the Canadian Provinces.

The month opened with relatively low pressure throughout the northern section of the country from the Rocky Mountain region eastward to the Atlantic. Elsewhere the pressure was near or slightly above the normal.

During the first decade, except for the occasional passage of a low area, the pressure was relatively high throughout most sections east of the Rocky Mountains, except along the northern border, where it was generally below the normal, as well as to the westward of the Rocky Mountains.

During the second and third decades extensive and well-defined low and high pressure areas followed each other across the country at somewhat frequent intervals, and the month closed with relatively high pressure throughout the southeastern districts and in the North Pacific States. Elsewhere it was near the normal, except in the Rocky Mountain region and to the eastward in the Canadian Provinces, and over the Northern States, where relatively low pressure obtained.

The distribution of the highs and lows was generally favorable for westerly and northwesterly winds along the coastal portion of the New England and Middle Atlantic States, the Missouri and upper Mississippi Valleys and upper Lake region, northerly and northeasterly along the coastal portion of the South Atlantic and East Gulf States, southerly and southwesterly in the lower Lake region, the Ohio and central Mississippi Valleys, and western Gulf States. Elsewhere variable winds prevailed.

### TEMPERATURE.

The eastward movement of low-pressure areas along the northern border, referred to in the REVIEW for October, continued during the early part of November, and unusual warmth, with much bright sunshine, was a marked feature of the weather during the greater part of the first decade. The average temperature during the period from the 1st to 8th, inclusive, was above the normal in all parts of the country, the period being specially warm in the great central valleys and Southwest, where the departures from normal ranged from 10 to 18 degrees per day.

By the 8th an area of high pressure had advanced to the upper Mississippi Valley and a change to considerably colder weather overspread most northern and central districts during the next two days, but this was soon followed by falling pressure in the West, and warmer weather again overspread most central and eastern districts. In the far Northwest, however, the weather had steadily grown colder and during the period from about the 9th to 13th, inclusive, cooler weather overspread most of the western Mountain and Pacific Coast States, the average temperatures for the 5-day period ranging from 5 to 9 degrees below the normal over much of the region. To the eastward of the mountains, however, the weather, except for short periods, continued warmer than usual, especially so over the Gulf and South Atlantic States, where some unusually high temperatures for November were recorded and the average temperatures for the period ranged from 10 to nearly 15 degrees above the normal.

By the morning of the 13th the pressure had become high over the northern Plateau region and the first zero temperatures of the season were reported from exposed points in Wyoming and southern Montana, with flurries of snow in the mountains from central Colorado northward.

During the 14th to 16th the cool area advanced into the Gulf and South Atlantic States, with freezing temperatures and the first killing frost of the season over much of the cotton belt, thereby ending further growth of that staple for the season in practically all districts.

With the passage off the South Atlantic coast of the above-mentioned cold area, warmer weather followed in most districts and it continued warmer than usual for so late in November over all portions of the country save in the Lake region and portions of the Ohio and Mississippi valleys, where the average temperatures from about the 14th to 22d were near or slightly less than normal.

During the last decade of the month pressure was again low over northern districts, and temperatures continued higher than usual over nearly all portions of the country, except that near the end of the month a change to cooler weather overspread the Plains region and Southwest.

At the close of the month temperatures were again rising in the Middle West, and they were near or above the normal for the season over most other districts.

*Monthly averages.*—As in October, the monthly means of temperature were above the normal over all parts of the country save for small areas in the Plateau region and near the Pacific coast, where they were normal or slightly below. Over the central valleys the month, as a whole, was decidedly warm, the excess above the normal ranging very generally from 5 to 7 degrees, or slightly more. In the more eastern districts the excess was generally somewhat less, and along the immediate Atlantic

coast the monthly averages were, as a rule, only slightly higher than normal.

*Day temperatures.*—With much bright sunshine during the month, the days were correspondingly warmer and maximum temperatures were unusually high for the season of the year.

From about the 4th to 7th the day temperatures over much of the central portions of the country were as high as or higher than had previously been recorded in November during a period of 40 years or more. This was especially true in Iowa and portions of surrounding States where on the 7th the extremes of previous years were exceeded by from 3 to 7 degrees. At Madison, Wis., the maximum on the 7th was 6 degrees higher than had been reported in any previous November during about 60 years of record. Again, about the 12th, the day temperatures were unusually high over the Southeastern States, especially near the south Atlantic and east Gulf coasts.

*Night temperatures.*—Clear weather at night favored radiation, and the mimimum temperatures were moderately low, as compared with the day temperatures, but the extremes of November for other years were not reached in any portion of the country, nor were they closely approached save in a few instances. Freezing temperatures were reported from all districts save along the immediate south Atlantic coast, over the southern portions of the Gulf States, at the lower elevations of Arizona and California, and along the Pacific coast

Temperatures of 0°F. were reported from points in the northern Plains and northern Rocky Mountain regions, and temperatures of 10° or lower occurred as far south as Colorado and northern Arizona.

## PRECIPITATION.

The early part of November, 1915, was remarkably free from storms of any character, bright sunshiny weather prevailing in most districts till near the end of the first decade, when a storm of considerable intensity moved from Colorado to the upper Lake region, accompanied by thunderstorms and considerable rain in portions of the Mississippi Valley and Lake region.

On the morning of the 10th a low area was observed over Colorado, which developed considerable energy during the following 24 hours, by which time it had moved rapidly to the western end of Lake Superior. In its course over the Great Plains region it was attended by high southerly winds, reaching tornadic force in portions of Kansas. At Great Bend, in that State, several large flouring mills were destroyed, a number of persons were killed, and large property losses resulted. Over other districts in Kansas, and to the northeastward, high winds, with thunderstorms, prevailed and heavy rains occurred locally. This storm passed to the northward of the Great Lakes during the 12th, but during its progress considerable rain fell on the 11th and 12th from central Texas northeastward to the lower Lakes.

During the 14th and 15th a storm of considerable intensity moved from the Texas coast northeastward to New England, giving the first general rain of the month over the districts to eastward of the Mississippi, the falls being quite heavy in portions of the Gulf States and Ohio Valley. At the same time rain set in over the far Northwest, and some heavy falls were reported from points in Oregon and Washington.

On the morning of the 18th low pressure had developed in the Southwest and during the day two storm centers formed and advanced to the northeastward, one over the Southeastern States and the principal one from the vicinity of Arkansas to the Great Lakes. During the night of the 18th the two storms appear to have united, and at 8 a. m. of the 19th the combined center was over Lake Michigan as a low pressure of marked force. High winds accompanied the storm in the Lake region and along the north Atlantic coast, and precipitation was general and heavy in many districts to eastward of the Mississippi, the rain turning to snow in portions of the upper Mississippi Valley and the Lake Superior region.

On the 25th general cloudy conditions had overspread the central valleys, and during the following 24 hours rains occurred in the Mississippi Valley districts, with local heavy storms in the southern portion, especially in Arkansas, where in the vicinity of Hot Springs a tornado of marked severity occurred, a number of persons being killed and considerable property damage sustained. During the 26th this storm lost energy and disappeared to the northward of the Great Lakes, but more or less precipitation occurred over the eastern districts. Only scattered precipitation occurred during the latter part of the month, except that a storm of moderate intensity moved from the middle Plains region to the upper Lakes near the end, and light rains or snows prevailed in the vicinity of the path.

For the month, as a whole, precipitation was, as a rule, moderate and did not differ greatly from the November normal, although in Tennessee and portions of the adjoining States the amounts for the month totaled 6 or 7 inches, being about 2 inches more than the normal, and some local heavy falls occurred along the southeastern coast of the Florida Peninsula. In the Atlantic Coast States less than the normal amounts occurred, the greatest deficiencies appearing in the District of Columbia and portions of Maryland and Virginia.

In the Plains States, the Rocky Mountain region, and the central and southern portions of the Plateau districts the precipitation for the month was generally light, as is usual for this season of the year, while in western Texas and portions of New Mexico the month was rainless.

In the central and southern Pacific coast districts the amounts were generally less than 2 inches, being somewhat less than the usual fall for November, but to the northward they ranged from 4 to 15 inches, and did not differ greatly from the normal, except in the more northern portions, where less than the average amounts for November occurred.

*Snowfall.*—Snow fell throughout most sections of the country, except in the South Atlantic and Gulf States and along the Pacific coast. The falls were light over most districts, except in the mountain regions of the West, where in some sections rather heavy falls occurred in the higher regions of Washington, Oregon, and Idaho.

## GENERAL SUMMARY.

Considering all portions of the country and the month, as a whole, it may be safely stated that rarely have the weather conditions for an entire month been so generally favorable for all agricultural interests. Over the principal corn-growing States the early part of the month was without material rainfall and greatly favored the drying of the immature portions of the crop.

The generally mild weather favored the growth of wheat in all districts to eastward of the Rocky Mountains, and, with the exception of some of the later sown, the crop is reported in good condition to enter the winter

period. In the far Northwest lack of moisture during the early part of the month prevented plowing and sowing, and rains during the latter part still further delayed operations. As a result, fall seeding is still unfinished.

The continuation of warm weather in the South during the first half of the month favored the maturing of considerable late cotton, especially in Oklahoma, where the crop had continued late. Killing frost about the middle of the month, however, closed the season over practically all portions of the belt.

Over the southern trucking districts all fall work was well advanced. The ripening of citrus fruit was delayed, however, in Florida by warm weather, but in California the crop is maturing in the northern districts and shipments have begun.

Pastures continued green throughout the month in many districts, affording sufficient feed for stock, which is reported in good condition to enter the winter in all districts, save in the far Southwest, where drought has prevailed for some time, and in portions of the Northwest, where much fodder was injured by frost and the supply of winter feed is short.

*Average accumulated departures for November, 1915.*

| District. | Temperature. | | | Precipitation. | | | Cloudiness. | | Relative humidity. | |
|---|---|---|---|---|---|---|---|---|---|---|
| | General mean for the current month. | Departure for the current month. | Accumulated departure since Jan. 1. | General mean for the current month. | Departure for the current month. | Accumulated departure since Jan. 1. | General mean for the current month. | Departure from the normal. | General mean for the current month. | Departure from the normal. |
| | ° F. | ° F. | ° F. | Ins. | Ins. | Ins. | 0–10 | | P. ct. | P. ct. |
| New England | 42.0 | +2.6 | +14.2 | 2.08 | −1.50 | −5.60 | 5.8 | 0.0 | 70 | − 8 |
| Middle Atlantic | 45.9 | +1.7 | +11.2 | 1.35 | −1.50 | −3.00 | 5.1 | −0.2 | 69 | − 6 |
| South Atlantic | 57.3 | +3.2 | + 7.4 | 1.62 | −1.30 | −7.30 | 3.2 | −1.3 | 70 | − 8 |
| Florida Peninsula | 72.7 | +2.1 | − 3.6 | 2.43 | +0.20 | −4.00 | 4.0 | −0.5 | 76 | − 4 |
| East Gulf | 59.1 | +3.4 | + 7.5 | 2.74 | −0.80 | −0.60 | 3.4 | −1.2 | 73 | − 3 |
| West Gulf | 60.9 | +4.5 | + 1.5 | 1.90 | −1.20 | −4.50 | 4.5 | −0.1 | 67 | − 7 |
| Ohio Valley & Tennessee | 48.5 | +3.6 | + 1.0 | 3.32 | −0.40 | −2.20 | 5.1 | −0.6 | 70 | − 3 |
| Lower Lakes | 42.1 | +3.0 | + 1.5 | 1.96 | −1.00 | −1.40 | 7.0 | −0.3 | 73 | − 4 |
| Upper Lakes | 38.1 | +3.8 | + 9.7 | 3.22 | −0.40 | −2.10 | 7.4 | +0.3 | 78 | − 2 |
| North Dakota | 29.5 | +5.0 | +18.1 | 1.01 | +0.30 | −0.50 | 5.7 | +0.3 | 79 | 0 |
| Upper Mississippi Valley | 43.2 | +5.5 | + 5.7 | 2.68 | +0.70 | +6.30 | 6.1 | +0.8 | 71 | − 3 |
| Missouri Valley | 44.2 | +6.7 | + 3.1 | 1.16 | −0.10 | +7.70 | 4.5 | −0.3 | 66 | − 5 |
| Northern slope | 34.9 | +2.9 | + 5.6 | 0.57 | −0.20 | +2.40 | 6.0 | +1.2 | 66 | − 1 |
| Middle slope | 47.6 | +5.9 | − 3.8 | 0.48 | −0.50 | +7.50 | 3.6 | −0.3 | 57 | − 5 |
| Southern slope | 54.4 | +3.5 | − 6.7 | 0.05 | −1.20 | +1.00 | 2.9 | −2.3 | 47 | −16 |
| Southern Plateau | 51.8 | 0.0 | −15.3 | 0.23 | −0.40 | +0.60 | 2.4 | −0.4 | 38 | − 5 |
| Middle Plateau | 40.1 | +0.5 | + 0.1 | 0.56 | −0.40 | −1.60 | 5.4 | +1.5 | 55 | − 3 |
| Northern Plateau | 38.4 | −0.3 | +16.1 | 1.98 | +0.60 | 0.00 | 8.2 | +2.4 | 71 | − 3 |
| North Pacific | 44.5 | −0.6 | +21.6 | 8.12 | +0.80 | −6.40 | 8.5 | +1.0 | 80 | − 4 |
| Middle Pacific | 52.2 | −0.9 | + 7.5 | 1.87 | −1.30 | +1.50 | 5.0 | +0.5 | 73 | − 2 |
| South Pacific | 58.3 | +1.2 | +13.7 | 0.68 | −0.40 | +2.50 | 3.4 | +0.1 | 62 | − 5 |

## LOCAL STORMS DURING NOVEMBER.

The following notes of severe local storms have been taken from official reports to the Weather Bureau:

*Arkansas.*—Two tornadoes occurred in Arkansas on November 25, 1915, one at Hot Springs, at about 3:15 p. m., and one at Stamps and Bodcaw, at about 3:30 p. m.

The storm at Stamps and Bodcaw developed the characteristics of a tornado, the funnel-shaped cloud and the rotary winds being plainly evident. Several persons were injured and property valued at $25,000 was destroyed. The storm at Hot Springs, however, destroyed much more property and attracted the more attention because of the number of persons killed.

The Hot Springs tornado was first seen about 6 miles directly south of that town at about 3:10 or 3:15 p. m. and disappeared over Indian Mountain at 3:25 or 3:30 p. m., traveling about 7 miles in fifteen minutes, or at a rate of about 30 miles per hour. The path of the storm was about 9 miles long and varied from a few rods to one-fourth of a mile in width. An excellent description of the storm was given by Mr. T. C. Yerkes, clerk at the Arlington Hotel, who was at the top of Hot Springs Mountain and saw the tornado when it first formed in the southern portion of Hot Springs Creek Valley. He said:

> The tornado looked like a large balloon with a long tail from which smoke was escaping as it swayed from one side to the other, the end of the tail touching the ground most of the time as it came swinging along. At first it appeared as though it were coming directly over the mountain, but when about 2½ miles south of town it turned to the east, just touching the outskirts, then curved to the north again and crossed Indian Mountain into Saline River Valley. Wisps of cloud were continually forming and rushing into it from all sides. It took the tornado about 15 minutes to pass. We were preparing to run down the other side of the mountain, but when it changed its course we saw there was no danger and stayed to watch it. We saw heavy rain accompanying and following it and ran down to the hotel, but were drenched before we reached it. The roaring, grinding noise that accompanied the storm was almost deafening.

Although the storm was not so intense as many that have occurred, 10 persons were killed, 45 injured, and property valued at $300,000 was destroyed. The loss of life and property would doubtless have been appalling if the storm had not changed its course about 2½ miles south of the town, as it was moving directly toward the residence section.

*Florida.*—A tornado occurred at Pace, Fla., about 8 a. m. November 26, 1915 (see below).

*Kansas.*—On the evening of November 10, 1915, Great Bend, a thriving town of nearly 5,000 inhabitants, was struck by the most destructive tornado that has ever been reported in Kansas. This is the latest recorded date on which a tornado has occurred in Kansas, the next latest being November 8, 1870, in Republic County.

The Great Bend storm caused the death of 11 persons, injured between 50 and 75 more, and destroyed property in and near the city valued at approximately a million dollars. It first appeared about 16 miles southwest of Great Bend. Moving toward the northeast it next touched the ground at the Moses and Clayton south ranch, where about 1,000 sheep were killed. From there it swept across the southeast corner of Great Bend, demolishing everything in its path, which was from two to three blocks wide and sharply defined. The day had been unusually windy at Great Bend, but about 7 p. m. there was a lull for a few minutes, and at 7:07 p. m. the storm broke. The roaring that accompanied it was commonly described as being "like the sound of a hundred locomotives."

Owing to the total destruction of the electric light and water works plant the city was left in darkness, which greatly hampered the work of rescuing and caring for the injured.

Besides the electric light and water works plant, several large flouring mills, grain elevators, the Santa Fe passenger and freight depots, and about 125 residences were either destroyed or badly damaged.

The last evidence of the storm was found just west of Claflin, about 18 miles northeast of Great Bend. Altogether its path was about 35 miles long and not more than a quarter of a mile wide.

The second tornado of November 10 occurred near Pratt about 8:30 p. m., moving in a northeasterly direction from a point 2 miles south of Pratt to one 2 miles east. Its path was about 100 feet wide and sharply defined. The funnel-shaped cloud was not seen on account of the darkness, but the effects of the storm leave little doubt regarding its character. As it passed over no towns property destruction was comparatively

small, and no lives were lost, though there were some very narrow escapes and one person was injured. The value of the property destroyed, which includes chiefly farmhouses, barns, live stock, and crops already housed, was about $15,000.

The third storm formed about 10 p. m. a few miles southwest of Zyba (4 miles south of Pock, Sumner County) and moved northeastward, causing the death of 3 persons at Zyba and 1 at Derby, 10 miles to the northeast. Twenty-eight persons were injured by this storm, which also destroyed property to the estimated value of $50,000. Its path was 16 miles long, about one-eighth mile wide, and sharply defined. The funnel-shaped cloud was not seen on account of the darkness.

## TORNADO AT PACE, FLA., NOVEMBER 26, 1915.

William F. Reed, jr., local forecaster at Pensacola, Fla., reports that a tornado occurred at Pace, Fla. ($\phi = 30°\ 35'$ N.; $\lambda = 87°\ 14'$ W.) on November 26, 1915. Moderate to fresh southerly gales occurred at Pensacola between 8 p. m. November 25 and 8 a. m. of the 26th, the highest 5-minute rate being 48 miles per hour from the southwest at 7:05 a. m. on the 26th and the extreme rate 55 miles from the southwest at 7.01 a. m. On the morning of November 26 thunderstorms were occurring in the southern end of a low-pressure trough over the Mississippi Valley. At Pensacola portions of a rainbow had been observed in the west and northwest at 6:45 a. m.; at 6:55 a. m. threatening conditions were rapidly approaching; rain began at 7:02 a. m. This rain ended at 10:30 a. m., having amounted to 0.38 inch, of which 0.32 fell between 7 and 8 a. m. Faint peals of thunder were heard from 7:14 to 9:20 a. m.; lightning was observed from 7:18 to 8:20 a. m. No damage was done at Pensacola.

After reaching Pensacola the storm moved north-northeastward, doing the greatest damage at Pace, Fla. While on its way the storm appeared at Floridatown on Escambia Bay as a straight blow from the south-southwest, lasting only a few minutes and doing no damage.

The tornado seems to have reached Pace at 8 a. m. as a black funnel-shaped cloud coming from the southwest and moving toward the northeast. A distinct whirl was observed in the cloud which rose and fell at short intervals and was accompanied by "a roaring noise like 50 freight trains," and one person reports that the noise was mostly above the tree tops. There was some lightning and heavy rainfall for 20 minutes. The general direction in which trees and débris lay was from southwest to northeast; the length of the path at this place was 3 miles, with a width of one-fourth mile where the greatest destruction occurred. Another observer, whose house was moved 6 inches and whose sheds were carried 100 yards, found the path to be about 100 yards wide. No one was killed.

## WEATHER CONDITIONS OVER THE NORTH ATLANTIC DURING NOVEMBER, 1914.

The data presented are for November, 1914, and comparison and study of the same should be in connection with those appearing in the REVIEW for that month. The accompanying Chart IX (XLIII–131) shows for November, 1914, the averages of pressure, temperature, and the prevailing direction of the winds at Greenwich mean noon, together with the location and courses of the more severe storm tracks of the month.

During the month as a whole the distribution of the mean atmospheric pressure over the greater part of the ocean was similar to the normal, as shown on the Meteorological Chart of the North Atlantic Ocean for November. The Azores high was of less area and of slightly greater intensity than normal, while its crest was about 6° west of its usual position.

The center of the Icelandic low was too far north to be shown on the chart, but judging from the nearly normal location of the 29.70 isobar, it is probably not far from its normal position. Over the northern-central part of the ocean there were more than the average number of gales reported, although in many instances it was impossible to show the movement of the storm from day to day on account of lack of observations.

On Chart III (XLII–78), showing the tracks of low areas for November, 1914, published in the REVIEW for that month, a low (I on Chart IX) is shown that first appeared on November 1, over the Pacific Ocean off the coast of Vancouver Island. This moved in an easterly direction through southern Canada, and on the morning of the 5th was on the Atlantic coast near Chatham, Canada. On November 6, 1914, the apparent center was near latitude 51° N. and longitude 46° W., several vessels to the eastward reporting winds of from 40 to 48 miles an hour, with rain, while in the central and southern portions of the area moderate winds and fog prevailed. On November 7 it had moved northeastward and was central near latitude 59° N. and longitude 26° W., the wind having decreased in force. By the 8th the storm had moved beyond the limits of the chart.

A second low (II on Chart IX) appeared in Alberta near latitude 51° and longitude 115° on the morning of November 11. This moved in a southeasterly direction and passed over Chicago on the night of the 12th; thence curving slightly to the northward it reached the Canadian coast near Chatham on the morning of the 14th, moderate winds of from 36 to 40 miles prevailing. On November 15 it was central near latitude 49° and longitude 45°, the barometer having fallen slightly and the winds increased to a maximum of 48 miles. On the 16th it had moved to latitude 51° and longitude 36°, where one vessel reported a barometer reading of 29.05 inches and several encountered winds of 64 miles an hour, accompanied by hail and rain. No trace of this storm could be seen on the 17th, and it had evidently moved in a northerly direction off the limits of the chart.